

# SEQUENCE LISTING

<110> Famodu, Layo O.  
Orozco, Buddy  
Rafalski, Antoni

<120> Plant Aminoacyl-tRNA Synthetase

<130> BB-1191

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<150> 60/092,866

<151> July 15, 1998

<160> 29

<170> Microsoft Office 97

<210> 1

<211> 1948

<212> DNA

<213> Zea mays

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 <211> 546  
 <212> PRT  
 <213> Zea mays

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 35 40 45  
 Gln Gln Gln Gln Gln Pro Ala Asp Ala Glu Asp Pro Phe Ala Ala Asn  
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 Tyr Gly Glu Val Pro Val Glu Glu Ile Gln Ser Lys Ala Ile Ser Gly  
 65 70 75 80  
 Arg Ser Trp Ser His Val Gly Asp Leu Asp Asp Ser Ala Ala Gly Arg  
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 Ser Val Leu Ile Arg Gly Ala Ala Gln Ala Ile Arg Pro Val Ser Lys  
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 Lys Met Ala Phe Val Val Leu Arg Gln Ser Met Ser Thr Val Gln Cys  
 115 120 125  
 Val Leu Val Ala Ser Ala Asp Ala Gly Val Ser Thr Gln Met Val Arg  
 130 135 140  
 Phe Ala Thr Ala Leu Ser Lys Glu Ser Ile Val Asp Val Glu Gly Val  
 145 150 155 160  
 Val Ser Leu Pro Lys Glu Pro Leu Lys Ala Thr Thr Gln Gln Val Glu  
 165 170 175  
 Ile Gln Val Arg Lys Ile Tyr Cys Ile Asn Arg Ala Ile Pro Thr Leu  
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 Pro Ile Asn Leu Glu Asp Ala Ala Arg Ser Glu Ala Asp Phe Glu Lys  
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 Ala Glu Leu Ala Gly Glu Lys Leu Val Arg Val Gly Gln Asp Thr Arg  
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 225 230 235 240  
 Phe Arg Ile Gln Cys Gln Val Glu Asn Lys Phe Arg Asp Phe Leu Leu  
 245 250 255  
 Ser Lys Asn Phe Val Gly Ile His Thr Pro Lys Leu Ile Ser Gly Ser  
 260 265 270  
 Ser Glu Gly Gly Ala Ala Val Phe Lys Leu Leu Tyr Asn Gly Gln Pro  
 275 280 285

Ala Cys Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met Ala Ile Ser  
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Gly Gly Phe Glu Arg Val Phe Glu Val Gly Pro Val Phe Arg Ala Glu  
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Asn Ser Asn Thr His Arg His Leu Cys Glu Phe Val Gly Leu Asp Ala  
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Glu Met Glu Ile Lys Glu His Tyr Phe Glu Val Cys Asp Ile Ile Asp  
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Gly Leu Phe Val Ser Ile Phe Lys His Leu Ser Glu Asn Cys Lys Lys  
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Glu Leu Glu Ser Ile Asn Arg Gln Tyr Pro Phe Glu Pro Leu Lys Tyr  
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Lys Glu Ala Gly Thr Glu Ile Glu Pro Met Gly Asp Leu Asn Thr Glu  
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Ala Glu Lys Lys Leu Gly Arg Leu Val Arg Glu Lys Tyr Asp Thr Asp  
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Phe Phe Ile Leu Tyr Arg Tyr Pro Leu Ala Val Arg Pro Phe Tyr Thr  
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Met Pro Cys Tyr Asp Asn Pro Ala Tyr Thr Asn Ser Phe Asp Val Phe  
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Ile Arg Gly Glu Glu Ile Ile Ser Gly Ala Gln Arg Ile His Thr Pro  
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Glu Leu Leu Ala Lys Arg Ala Thr Glu Cys Gly Ile Asp Val Ser Thr  
485 490 495

Ile Ser Ala Tyr Ile Glu Ser Phe Ser Tyr Gly Val Pro Pro His Gly  
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Gly Phe Gly Val Gly Leu Glu Arg Val Val Met Leu Phe Cys Ala Leu  
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Val Pro  
545

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<211> 730  
<212> DNA  
<213> Oryza sativa

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ggagaagtat ggaacagaat ttttcacct ctatcggtat cctttggctg tgcgtccctt 180

ctacaccatg ccttggtatg acaaccacgc ttacagtaac tcttttgatg tctttattcg 240  
aggagaggaa ataatatctg gagcacaaag aatacattta ccagagctat tgacgaaacg 300  
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tggtgcacct cctcatggtg gttttggtgt cggcctggag aggggtggtaa tgctgttctg 420  
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<212> PRT  
<213> Oryza sativa

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Thr Glu Phe Phe Ile Leu Tyr Arg Tyr Pro Leu Ala Val Arg Pro Phe  
35 40 45  
Tyr Thr Met Pro Cys Tyr Asp Asn Pro Ala Tyr Ser Asn Ser Phe Asp  
50 55 60  
Val Phe Ile Arg Gly Glu Glu Ile Ile Ser Gly Ala Gln Arg Ile His  
65 70 75 80  
Leu Pro Glu Leu Leu Thr Lys Arg Ala Thr Glu Cys Gly Ile Asp Ala  
85 90 95  
Ser Thr Ile Ser Ser Tyr Ile Glu Ser Phe Ser Tyr Gly Ala Pro Pro  
100 105 110  
His Gly Gly Phe Gly Val Gly Leu Glu Arg Val Val Met Leu Phe Cys  
115 120 125  
Ala Leu Asn Asn Ile Arg Lys Thr Ser Leu Phe Pro Arg Asp Pro Gln  
130 135 140  
Arg Leu Val Pro  
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<211> 1109  
<212> DNA  
<213> Glycine max

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tgtcgaaggc gttgtttcga tccctccgc tcccatcaaa ggccgacac aacaggtgga 180  
aattcaagtg aggaagttgt attgtgtcag tagggctgta cctactctgc ctattaatct 240  
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 <212> PRT  
 <213> Glycine max

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 35 40 45  
 Ser Ala Pro Ile Lys Gly Ala Thr Gln Gln Val Glu Ile Gln Val Arg  
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 Lys Leu Tyr Cys Val Ser Arg Ala Val Pro Thr Leu Pro Ile Asn Leu  
 65 70 75 80  
 Glu Asp Ala Ala Arg Ser Glu Val Glu Ile Glu Thr Ala Leu Gln Ala  
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 Gly Glu Gln Leu Val Arg Val Asn Gln Asp Thr Arg Leu Asn Phe Arg  
 100 105 110  
 Val Leu Asp Val Arg Thr Pro Ala Asn Gln Gly Ile Phe Arg Ile Gln  
 115 120 125  
 Ser Gln Val Gly Asn Ala Phe Arg Gln Phe Leu Leu Ser Glu Gly Phe  
 130 135 140  
 Cys Glu Ile His Thr Pro Lys Leu Ile Ala Gly Ser Ser Glu Gly Gly  
 145 150 155 160  
 Ala Ala Val Phe Arg Leu Asp Tyr Lys Gly Gln Pro Ala Cys Leu Ala  
 165 170 175  
 Gln Ser Pro Gln Leu His Lys Gln Met Ser Ile Cys Gly Asp Phe Gly  
 180 185 190  
 Arg Val Phe Glu Ile Gly Pro Val Phe Arg Ala Glu Asp Ser Tyr Thr  
 195 200 205  
 His Arg His Leu Cys Glu Phe Thr Gly Leu Asp Val Glu Met Glu Ile  
 210 215 220

Lys Lys His Tyr Phe Glu Val Met Asp Ile Val Asp Arg Leu Phe Val  
225 230 235 240

Ala Met Phe Asp Ser Leu Asn Gln Asn Cys Lys Lys Asp Leu Glu Ala  
245 250 255

Val Gly Ser Gln Tyr Pro Phe Glu Pro Leu Lys Tyr Leu Arg Thr Thr  
260 265 270

Leu Arg Leu Thr Tyr Glu Glu Gly Ile Gln Met Leu Lys Asp Val Gly  
275 280 285

Val Glu Ile Glu Pro Tyr Gly Asp Leu Asn Thr Glu Ala Glu Arg Lys  
290 295 300

Leu Gly Gln Leu Val Ser Glu Lys Tyr Gly Thr Glu Phe Tyr Ile Leu  
305 310 315 320

His Arg Tyr Pro Leu Ala Val Arg Pro Phe Tyr Thr Met Pro Cys Tyr  
325 330 335

Asp Asn Pro Ala Tyr Ser Asn Ser Phe Asp Val Phe Ile Arg Gly Glu  
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<210> 7

<211> 836

<212> DNA

<213> Triticum aestivum

<400> 7

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<211> 98

<212> PRT

<213> Triticum aestivum

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Pro Ala Tyr Leu Ala Gln Ser Leu Gln Ser Tyr Lys Gln Met Ser Ile  
35 40 45  
Cys Gly Gly Phe Gly Arg Val Phe Glu Ala Gly Pro Val Phe Arg Ser  
50 55 60  
Glu Lys Ser Asn Thr His Arg His Leu Cys Glu Phe Ile Gly Leu Asp  
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Ala Glu Met Glu Ile Lys Glu His Tyr Phe Glu Val Cys Asp Ile Ile  
85 90 95

Asp Cys

<210> 9  
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<212> DNA  
<213> Zea mays

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<210> 10  
 <211> 599  
 <212> PRT  
 <213> Zea mays

<400> 10

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Leu Ala Arg Ala Thr Thr Met Ala Glu Glu Val Gln Ala Pro Leu Ser  
 35 40 45

Ala Thr Met Ala Lys Glu Ala Gln Ser Pro Pro Ser Ala Thr Ile Ala  
 50 55 60

Glu Ala Thr Ala Pro Pro Gln Leu Leu Leu Phe Asn Ser Phe Thr Lys  
 65 70 75 80

Arg Glu Glu Pro Phe Gln Pro Arg Val Glu Gly Lys Val Gly Met Tyr  
 85 90 95

Val Cys Gly Val Thr Pro Tyr Asp Phe Ser His Ile Gly His Ala Arg  
 100 105 110

Ala Tyr Val Ala Phe Asp Val Leu Tyr Arg Tyr Leu Lys Phe Leu Gly  
 115 120 125

Tyr Glu Val Glu Tyr Val Arg Asn Phe Thr Asp Ile Asp Asp Lys Ile  
 130 135 140

Ile Lys Arg Ala Asn Glu Arg Gly Glu Thr Val Thr Ser Leu Ser Ser  
 145 150 155 160

Gln Phe Ile Asn Glu Phe Leu Leu Asp Met Thr Glu Leu Gln Cys Leu  
 165 170 175

Pro Pro Thr Cys Glu Pro Arg Val Thr Glu His Ile Glu His Ile Ile  
 180 185 190

Lys Leu Ile Thr Gln Ile Met Glu Asn Gly Lys Ala Tyr Ala Ile Glu  
 195 200 205

Gly Asp Val Tyr Phe Ser Val Glu Ser Phe Pro Glu Tyr Leu Ser Leu  
 210 215 220

Ser Gly Arg Lys Phe Asp Gln Asn Gln Ala Gly Ala Arg Val Ala Phe  
 225 230 235 240

Asp Thr Arg Lys Arg Asn Pro Ala Asp Phe Ala Leu Trp Lys Ala Ala  
 245 250 255

Lys Glu Gly Glu Pro Phe Trp Asp Ser Pro Trp Gly Arg Gly Arg Pro  
 260 265 270

Gly Trp His Ile Glu Cys Ser Ala Met Ser Ala His Tyr Leu Gly His  
 275 280 285



Val Phe Asp Ile His Gly Gly Gly Lys Asp Leu Ile Phe Pro His His  
 290 295 300  
 Glu Asn Glu Leu Ala Gln Ser Arg Ala Ala Tyr Pro Asp Ser Glu Val  
 305 310 315 320  
 Lys Cys Trp Met His Asn Gly Phe Val Asn Lys Asp Asp Lys Lys Met  
 325 330 335  
 Ala Lys Ser Asp Asn Asn Phe Phe Thr Ile Arg Asp Ile Ile Ala Leu  
 340 345 350  
 Tyr His Pro Met Ala Leu Arg Phe Phe Leu Met Arg Thr His Tyr Arg  
 355 360 365  
 Ser Asp Val Asn His Ser Asp Gln Ala Leu Glu Ile Ala Ser Asp Arg  
 370 375 380  
 Val Tyr Tyr Ile Tyr Gln Thr Leu Tyr Asp Cys Glu Glu Val Leu Ala  
 385 390 395 400  
 Thr Tyr Arg Glu Glu Gly Thr Ser Leu Pro Val Pro Ser Glu Glu Gln  
 405 410 415  
 Asn Leu Ile Gly Lys His His Ser Glu Phe Leu Lys His Met Ser Asn  
 420 425 430  
 Asp Leu Lys Thr Thr Asp Val Leu Asp Arg Cys Phe Met Glu Leu Leu  
 435 440 445  
 Lys Ala Ile Asn Ser Ser Leu Asn Asp Leu Lys Lys Leu Gln Gln Lys  
 450 455 460  
 Ile Glu Gln Gln Lys Lys Lys Gln Gln Gln Gln Lys Lys Gln Gln Gln  
 465 470 475 480  
 Gln Lys Gln Gln Gln Gln Lys Gln Gln Gln Leu Gln Lys Gln Pro Glu  
 485 490 495  
 Asp Tyr Ile Gln Ala Leu Ile Ala Leu Glu Thr Glu Leu Lys Asn Lys  
 500 505 510  
 Leu Ser Ile Leu Gly Leu Met Pro Ser Ser Ser Leu Ala Glu Val Leu  
 515 520 525  
 Lys Gln Leu Lys Asp Lys Ser Leu Lys Arg Ala Gly Leu Thr Glu Glu  
 530 535 540  
 Gln Leu Gln Glu Gln Ile Glu Gln Arg Asn Val Ala Arg Lys Asn Lys  
 545 550 555 560  
 Gln Phe Glu Ile Ser Asp Gly Ile Arg Lys Asn Leu Ala Thr Lys Gly  
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 <212> DNA  
 <213> Oryza sativa

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 atacaagaaa gcggaaccct gcagactttg cgctgtggaa ggctgctaag gaaggcgaac 660  
 ctttctggga tagcccatgg ggccgtggta gaccaggatg gcatattgaa tgcagtgcga 720  
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 aaaatttctt cacaatccga gatattattg atctgtacca tcccatggct ttgaggtttt 960  
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 agcaaattga gcagagaact gctgcaagga aaaacaagca gtttgatgtg tctgaccaa 1560  
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 tgcgtttctc gtggtgtaag aagcaaaacc ccatatactg atatactcga ggactccctt 1860  
 gttggatgtt atgctttgga tttgaatatt gaagtcaaat cataattaca tttgcatgat 1920  
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 <211> 548  
 <212> PRT  
 <213> Oryza sativa

<400> 12  
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 Leu Phe Asn Ser Met Thr Lys Lys Lys Glu Leu Phe Glu Pro Leu Val  
 35 40 45  
 Glu Gly Lys Val Arg Met Tyr Val Cys Gly Val Thr Pro Tyr Asp Phe  
 50 55 60

Ser His Ile Gly His Ala Arg Ala Tyr Val Ala Phe Asp Val Leu Tyr  
 65 70 75 80  
 Arg Tyr Leu Lys Phe Leu Gly Tyr Glu Val Glu Tyr Val Arg Asn Phe  
 85 90 95  
 Thr Asp Ile Asp Asp Lys Ile Ile Lys Arg Ala Asn Glu Ala Gly Glu  
 100 105 110  
 Thr Val Thr Ser Leu Ser Ser Arg Phe Ile Asn Glu Phe Leu Leu Asp  
 115 120 125  
 Met Ala Gln Leu Gln Cys Leu Pro Pro Thr Cys Glu Pro Arg Val Thr  
 130 135 140  
 Asp His Ile Glu His Ile Ile Glu Leu Ile Thr Lys Ile Met Glu Asn  
 145 150 155 160  
 Gly Lys Ala Tyr Ala Met Glu Gly Asp Val Tyr Phe Ser Val Asp Thr  
 165 170 175  
 Phe Pro Glu Tyr Leu Ser Leu Ser Gly Arg Lys Leu Asp His Asn Leu  
 180 185 190  
 Ala Gly Ser Arg Val Ala Val Asp Thr Arg Lys Arg Asn Pro Ala Asp  
 195 200 205  
 Phe Ala Leu Trp Lys Ala Ala Lys Glu Gly Glu Pro Phe Trp Asp Ser  
 210 215 220  
 Pro Trp Gly Arg Gly Arg Pro Gly Trp His Ile Glu Cys Ser Ala Met  
 225 230 235 240  
 Ser Ala His Tyr Leu Gly His Val Phe Asp Ile His Gly Gly Gly Lys  
 245 250 255  
 Asp Leu Ile Phe Pro His His Glu Asn Glu Leu Ala Gln Ser Arg Ala  
 260 265 270  
 Ala Tyr Pro Glu Ser Glu Val Lys Cys Trp Met His Asn Gly Phe Val  
 275 280 285  
 Asn Lys Asp Asp Gln Lys Met Ser Lys Ser Asp Lys Asn Phe Phe Thr  
 290 295 300  
 Ile Arg Asp Ile Ile Asp Leu Tyr His Pro Met Ala Leu Arg Phe Phe  
 305 310 315 320  
 Leu Met Arg Thr His Tyr Arg Gly Asp Val Asn His Ser Asp Lys Ala  
 325 330 335  
 Leu Glu Ile Ala Ser Asp Arg Val Tyr Tyr Ile Tyr Gln Thr Leu Tyr  
 340 345 350  
 Asp Cys Glu Glu Val Leu Ser Gln Tyr Arg Gly Glu Asn Ile Ser Val  
 355 360 365  
 Pro Val Pro Val Glu Glu Gln Asp Met Val Asn Lys His His Ser Glu  
 370 375 380

Phe Leu Glu Ser Met Ala Asp Asp Leu Arg Thr Thr Asp Val Leu Asp  
385 390 395 400

Gly Phe Thr Asp Leu Leu Lys Ala Ile Asn Ser Asn Leu Asn Asp Phe  
405 410 415

Lys Lys Leu Gln Gln Lys Leu Glu Gln Gln Lys Lys Lys Gln Gln Gln  
420 425 430

Gln Lys Gln Gln Lys Gln Lys Gln Gln Gln Ala Gln Lys Gln Pro Glu  
435 440 445

Glu Tyr Ile Gln Ala Met Phe Ala Leu Glu Thr Glu Ile Lys Asn Lys  
450 455 460

Ile Ser Ile Leu Gly Leu Met Pro Pro Ser Ser Leu Ala Glu Ala Leu  
465 470 475 480

Lys Gln Leu Lys Asp Lys Ala Leu Lys Arg Ala Gly Leu Thr Glu Glu  
485 490 495

Leu Leu Gln Glu Gln Ile Glu Gln Arg Thr Ala Ala Arg Lys Asn Lys  
500 505 510

Gln Phe Asp Val Ser Asp Gln Ile Arg Lys Gln Leu Gly Ser Lys Gly  
515 520 525

Ile Ala Leu Met Asp Glu Pro Thr Gly Thr Val Trp Arg Pro Cys Glu  
530 535 540

Pro Glu Ser Glu  
545

<210> 13  
<211> 2183  
<212> DNA  
<213> Glycine max

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actccgctcc acccagactc cacgccgcca tcttcaggag caaaaacttt tctttttgcg 180  
ccacctcgtc cccgccgttg acggcggaga aggggttgcg caaatccgac gccgagtgtc 240  
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ccaaagtga atccaaagtg ggaatgtacg tgtgcggcgt caccgcttat gatcttagcc 360  
atattggaca cgctcgcgta tacgtcaatt tcgaccttct ttacagatac tttaagcatt 420  
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gagcaaagga gttaggagaa gatccaatca gtttgagctg gcgctattgt gaagagtctt 540  
gtcaagacat ggtaactctt aattgtctgt ctccctctgt ggaaccaaag gtctcagagc 600  
acatgcccc aatcattgat atgattgaga agatccttaa taatgggtat gcctacattg 660  
ttgatgggga tgtgtacttt aatgtagaaa aatttccaga atatgggaaa ctatctagtc 720  
gagatctaga agataatcga gctgggtgaga gggttgcagt tgattctaga aagaaaaatc 780  
ctgctgattt tgctcttttg aagtctgcaa agccagggga gccatttttg gagagtccct 840  
ggggtcctgg aagacctggg tggcatattg aatgcagtg catgagtga gcttatcttg 900  
gttactcttt tgatatccat ggtggaggaa tcgaccttgt gtttctcac catgagaatg 960  
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gttttgtcac cattgactct gtgaaaatgt caaatcttt gggaatttt ttcacaatac 1080  
gtcaggttat agacgtttac catccactgg ccttgagata ttttttgat agcgcacatt 1140  
atcgatctcc tattaactac tcaaataac agctcgaaag tgcttcagac cgtgtttttt 1200  
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attccacccc accggatact ttggatatta ttgataagtt ccacgatgtt tttttgacct 1320  
 caatgtcggg tgatcttcac actccagttg tattggctgg aatgtctgat ccattaaaaat 1380  
 caatcaatga tttgctgcat gctcgtgaagg ggaaaaaaca acaatttcga atcgaatcac 1440  
 tatcagcttt ggagaagagc gtcagggatg tccttactgt tttaggactt atgcctgcaa 1500  
 gttactctga ggttttgagc cagcttaagg taaaagcttt aaaacgtgca aactttacgg 1560  
 aagaagaagt cttgcagaaa attgaagaac gggctactgc tagaatgcaa aaggagtatg 1620  
 ctaaactcggg tgcaatcagg aaggatttgg ctgtacttgg tattactctt atggacagtc 1680  
 caaatggcac aacttgagg cctgccattc ctcttccact tcaagagctg ctctaagtca 1740  
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 tttttaaaaa aaaaaaaaaa aaa 2183

<210> 14  
 <211> 574  
 <212> PRT  
 <213> Glycine, max

<400> 14  
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 Met Leu Phe Pro His Ser Ala Pro Pro Arg Leu His Ala Ala Ile Phe  
 35 40 45  
 Arg Ser Lys Asn Phe Ser Phe Cys Ala Thr Ser Ser Pro Pro Leu Thr  
 50 55 60  
 Ala Glu Lys Gly Cys Gly Lys Ser Asp Ala Glu Cys Pro Thr Leu Pro  
 65 70 75 80  
 Glu Val Trp Leu His Asn Thr Met Ser Arg Thr Lys Glu Leu Phe Lys  
 85 90 95  
 Pro Lys Val Glu Ser Lys Val Gly Met Tyr Val Cys Gly Val Thr Ala  
 100 105 110  
 Tyr Asp Leu Ser His Ile Gly His Ala Arg Val Tyr Val Asn Phe Asp  
 115 120 125  
 Leu Leu Tyr Arg Tyr Phe Lys His Leu Gly Phe Glu Val Cys Tyr Val  
 130 135 140  
 Arg Asn Phe Thr Asp Val Asp Asp Lys Ile Ile Ala Arg Ala Lys Glu  
 145 150 155 160  
 Leu Gly Glu Asp Pro Ile Ser Leu Ser Trp Arg Tyr Cys Glu Glu Phe  
 165 170 175  
 Cys Gln Asp Met Val Thr Leu Asn Cys Leu Ser Pro Ser Val Glu Pro  
 180 185 190

Lys Val Ser Glu His Met Pro Gln Ile Ile Asp Met Ile Glu Lys Ile  
 195 200 205  
 Leu Asn Asn Gly Tyr Ala Tyr Ile Val Asp Gly Asp Val Tyr Phe Asn  
 210 215 220  
 Val Glu Lys Phe Pro Glu Tyr Gly Lys Leu Ser Ser Arg Asp Leu Glu  
 225 230 235 240  
 Asp Asn Arg Ala Gly Glu Arg Val Ala Val Asp Ser Arg Lys Lys Asn  
 245 250 255  
 Pro Ala Asp Phe Ala Leu Trp Lys Ser Ala Lys Pro Gly Glu Pro Phe  
 260 265 270  
 Trp Glu Ser Pro Trp Gly Pro Gly Arg Pro Gly Trp His Ile Glu Cys  
 275 280 285  
 Ser Ala Met Ser Ala Ala Tyr Leu Gly Tyr Ser Phe Asp Ile His Gly  
 290 295 300  
 Gly Gly Ile Asp Leu Val Phe Pro His His Glu Asn Glu Ile Ala Gln  
 305 310 315 320  
 Ser Cys Ala Ala Cys Lys Lys Ser Asp Ile Ser Ile Trp Met His Asn  
 325 330 335  
 Gly Phe Val Thr Ile Asp Ser Val Lys Met Ser Lys Ser Leu Gly Asn  
 340 345 350  
 Phe Phe Thr Ile Arg Gln Val Ile Asp Val Tyr His Pro Leu Ala Leu  
 355 360 365  
 Arg Tyr Phe Leu Met Ser Ala His Tyr Arg Ser Pro Ile Asn Tyr Ser  
 370 375 380  
 Asn Ile Gln Leu Glu Ser Ala Ser Asp Arg Val Phe Tyr Ile Tyr Glu  
 385 390 395 400  
 Thr Leu His Glu Cys Glu Ser Phe Leu Asn Gln His Asp Gln Arg Lys  
 405 410 415  
 Asp Ser Thr Pro Pro Asp Thr Leu Asp Ile Ile Asp Lys Phe His Asp  
 420 425 430  
 Val Phe Leu Thr Ser Met Ser Asp Asp Leu His Thr Pro Val Val Leu  
 435 440 445  
 Ala Gly Met Ser Asp Pro Leu Lys Ser Ile Asn Asp Leu Leu His Ala  
 450 455 460  
 Arg Lys Gly Lys Lys Gln Gln Phe Arg Ile Glu Ser Leu Ser Ala Leu  
 465 470 475 480  
 Glu Lys Ser Val Arg Asp Val Leu Thr Val Leu Gly Leu Met Pro Ala  
 485 490 495  
 Ser Tyr Ser Glu Val Leu Gln Gln Leu Lys Val Lys Ala Leu Lys Arg  
 500 505 510

Ala Asn Phe Thr Glu Glu Glu Val Leu Gln Lys Ile Glu Glu Arg Ala  
515 520 525

Thr Ala Arg Met Gln Lys Glu Tyr Ala Lys Ser Asp Ala Ile Arg Lys  
530 535 540

Asp Leu Ala Val Leu Gly Ile Thr Leu Met Asp Ser Pro Asn Gly Thr  
545 550 555 560

Thr Trp Arg Pro Ala Ile Pro Leu Pro Leu Gln Glu Leu Leu  
565 570

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<211> 633  
<212> DNA  
<213> Zea mays

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cacgtcctcc accgtccgce gcacttcgcg tacacctgct taaggagtgg cgttgggtgcc 180  
cgaggaggag tgctcgcttc tggcatccac ccactccgtc gtctcaattg cagcgcgggtt 240  
gaagccgttc ccggccccac cgaggaggcg cctgctcctc aggcaaggaa gaaaagagta 300  
gtttctgggtg tacagccaac aggatcggtt caccttggaa attatctagg ggcaattaag 360  
aattgggttg cacttcagga ttcatatgag acattctttt tcatcgtgga tcttcatgca 420  
attactttac catatgaggc gccactgctt tctaaagcaa caagaagcac tgctgcaata 480  
tatcttgcac gtggcgctga cagctccaag gcttctatct ttgtacagtc tcatgtccgt 540  
gctcatgttg agttgatgtg gctattgagt tcttctactc ctattggctg gctgaataga 600  
atgatccagt tcaaagagaa gtctcgcaag gcg 633

<210> 16  
<211> 410  
<212> PRT  
<213> Zea mays

<400> 16  
His Gly Asp Asp Ala Met Ser Arg Ala Leu Leu Ser His Val Leu His  
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Arg Pro Pro His Phe Ala Tyr Thr Cys Leu Arg Ser Gly Val Gly Ala  
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Arg Gly Gly Val Leu Ala Ser Gly Ile His Pro Leu Arg Arg Leu Asn  
35 40 45

Cys Ser Ala Val Glu Ala Val Pro Gly Pro Thr Glu Glu Ala Pro Ala  
50 55 60

Pro Gln Ala Arg Lys Lys Arg Val Val Ser Gly Val Gln Pro Thr Gly  
65 70 75 80

Ser Val His Leu Gly Asn Tyr Leu Gly Ala Ile Lys Asn Trp Val Ala  
85 90 95

Leu Gln Asp Ser Tyr Glu Thr Phe Phe Phe Ile Val Asp Leu His Ala  
100 105 110

Ile Thr Leu Pro Tyr Glu Ala Pro Leu Leu Ser Lys Ala Thr Arg Ser  
115 120 125

Thr Ala Ala Ile Tyr Leu Ala Cys Gly Val Asp Ser Ser Lys Ala Ser  
 130 135 140  
 Ile Phe Val Gln Ser His Val Arg Ala His Val Glu Leu Met Trp Leu  
 145 150 155 160  
 Leu Ser Ser Ser Thr Pro Ile Gly Trp Leu Asn Arg Met Ile Gln Phe  
 165 170 175  
 Lys Glu Lys Ser Arg Lys Ala Gly Asp Glu Asn Val Gly Val Ala Leu  
 180 185 190  
 Leu Thr Tyr Pro Val Leu Met Ala Ser Asp Ile Leu Leu Tyr Gln Ser  
 195 200 205  
 Asp Leu Val Pro Val Gly Glu Asp Gln Thr Gln His Leu Glu Leu Thr  
 210 215 220  
 Arg Glu Ile Ala Glu Arg Val Asn Asn Leu Tyr Gly Gly Arg Lys Trp  
 225 230 235 240  
 Lys Lys Leu Gly Gly Arg Gly Gly Leu Leu Phe Lys Val Pro Glu Ala  
 245 250 255  
 Leu Ile Pro Pro Ala Gly Ala Arg Val Met Ser Leu Thr Asp Gly Leu  
 260 265 270  
 Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Gln Ser Arg Ile Asn Leu  
 275 280 285  
 Leu Asp Pro Lys Asp Val Ile Ala Asn Lys Ile Lys Arg Cys Lys Thr  
 290 295 300  
 Asp Ser Phe Pro Gly Met Glu Phe Asp Asn Pro Glu Arg Pro Glu Cys  
 305 310 315 320  
 Arg Asn Leu Leu Ser Ile Tyr Gln Ile Ile Thr Glu Lys Thr Lys Glu  
 325 330 335  
 Glu Val Val Ser Glu Cys Gln His Met Asn Trp Gly Thr Phe Lys Thr  
 340 345 350  
 Thr Leu Thr Glu Ala Leu Ile Asp His Leu Gln Pro Ile Gln Val Arg  
 355 360 365  
 Tyr Glu Glu Ile Met Ser Asp Pro Ala Tyr Leu Asp Asn Val Leu Leu  
 370 375 380  
 Glu Gly Ala Val Lys Ala Ala Glu Ile Ala Asp Ile Thr Leu Asn Asn  
 385 390 395 400  
 Val Tyr Gln Ala Met Gly Phe Leu Arg Arg  
 405 410

<210> 17  
 <211> 1536  
 <212> DNA  
 <213> Glycine max



<400> 17

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gggggttcagc	ccacgggctc	aattcacctc	ggaaactatt	ttggcgccat	caagaattgg	240
gttgcccctt	agaatgtgta	tgatacactt	ttcttcattg	tggacctgca	cgcgattaca	300
ttaccatatg	acaccaaca	attatctaag	gctacaaggt	caactgctgc	tatttaccta	360
gcatgtggag	tggatccctt	aaaggcttca	gtatttgtac	agtctcatgt	tcgggcacat	420
gtagaattga	tggtgctgct	aagttccaca	acaccaattg	gttggctgaa	caaaatgata	480
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tatggaggaa	gaaagtggaa	gaaattagcg	ggttatgaca	gccgaggtgg	tactatattt	720
aagggtccag	agccccttat	acctccagcc	ggagcccgga	taatgtccct	aactgatggc	780
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ggaaagacga	aagaggaagt	tgtgcaggaa	tgccaaaaca	tgaactgggg	cacattcaaa	1020
cctcttttaa	cagatgcctt	gattgatcat	ttgcatccca	ttcagggttcg	ctatgaggaa	1080
atcatgtccg	attcagggtta	tttagatgga	gttttagcac	aaggtgctag	aaatgcagca	1140
gatatagcag	attctacact	taataatatt	taccaagcaa	tgggattttt	taagagacag	1200
tgataattga	tgccaaataa	attaaagatt	ggcgagacgt	caacttaaaa	gctaacttct	1260
ggatgattca	tgatgggcct	caaaattttg	gagtaatcct	atggacatat	acttgactac	1320
tggaaatgga	aagattattg	atgcaaagcc	taaaggtccc	attagttcct	gatgcaatgg	1380
gctttgtatc	tccttcattt	ttctccgagt	atggtcgttg	ccttcatttt	atattttatt	1440
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<210> 18  
 <211> 400  
 <212> PRT  
 <213> Glycine max

<400> 18

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			20					25					30		
Ser	Arg	Ile	Arg	Cys	Cys	Thr	Thr	Leu	Thr	Ala	Thr	Ser	Ser	Glu	Thr
		35					40					45			
Pro	Thr	Pro	Thr	Phe	Val	Lys	Lys	Arg	Val	Val	Ser	Gly	Val	Gln	Pro
	50					55					60				
Thr	Gly	Ser	Ile	His	Leu	Gly	Asn	Tyr	Phe	Gly	Ala	Ile	Lys	Asn	Trp
	65				70					75					80
Val	Ala	Leu	Gln	Asn	Val	Tyr	Asp	Thr	Leu	Phe	Phe	Ile	Val	Asp	Leu
			85						90					95	
His	Ala	Ile	Thr	Leu	Pro	Tyr	Asp	Thr	Gln	Gln	Leu	Ser	Lys	Ala	Thr
			100					105					110		
Arg	Ser	Thr	Ala	Ala	Ile	Tyr	Leu	Ala	Cys	Gly	Val	Asp	Pro	Ser	Lys
			115				120					125			
Ala	Ser	Val	Phe	Val	Gln	Ser	His	Val	Arg	Ala	His	Val	Glu	Leu	Met
	130					135					140				

Trp Leu Leu Ser Ser Thr Thr Pro Ile Gly Trp Leu Asn Lys Met Ile  
 145 150 155 160  
 Gln Phe Lys Glu Lys Ser Arg Lys Ala Gly Asp Glu Glu Val Gly Val  
 165 170 175  
 Ala Leu Leu Thr Tyr Pro Val Leu Met Ala Ser Asp Ile Leu Leu Tyr  
 180 185 190  
 Gln Ser Asp Phe Val Pro Val Gly Glu Asp Gln Lys Gln His Leu Glu  
 195 200 205  
 Leu Thr Arg Asp Leu Ala Glu Arg Val Asn Asn Leu Tyr Gly Gly Arg  
 210 215 220  
 Lys Trp Lys Lys Leu Gly Gly Tyr Asp Ser Arg Gly Gly Thr Ile Phe  
 225 230 235 240  
 Lys Val Pro Glu Pro Leu Ile Pro Pro Ala Gly Ala Arg Ile Met Ser  
 245 250 255  
 Leu Thr Asp Gly Leu Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Gln  
 260 265 270  
 Ser Arg Ile Asn Ile Leu Asp Pro Lys Asp Leu Ile Ala Asn Lys Ile  
 275 280 285  
 Lys Arg Cys Lys Thr Asp Ser Phe Pro Gly Leu Glu Phe Asp Asn Ser  
 290 295 300  
 Glu Arg Pro Glu Cys Asn Asn Leu Val Ser Ile Tyr Gln Leu Ile Ser  
 305 310 315 320  
 Gly Lys Thr Lys Glu Glu Val Val Gln Glu Cys Gln Asn Met Asn Trp  
 325 330 335  
 Gly Thr Phe Lys Pro Leu Leu Thr Asp Ala Leu Ile Asp His Leu His  
 340 345 350  
 Pro Ile Gln Val Arg Tyr Glu Glu Ile Met Ser Asp Ser Gly Tyr Leu  
 355 360 365  
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 370 375 380  
 Ser Thr Leu Asn Asn Ile Tyr Gln Ala Met Gly Phe Phe Lys Arg Gln  
 385 390 395 400

<210> 19  
 <211> 725  
 <212> DNA  
 <213> Triticum aestivum

<400> 19  
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 ccttcagatt tgtctcgcat taaccttctt gacccaaatg atgtgattgt gaacaaaatc 180  
 aaacgctgca aaactgactc gctccctggc ttggaattcg acaaccagga gaggcgggaa 240  
 tgcaaaaatc ttctctcagt ctaccagatc atcactggaa aaacgaaaga ggaagtgtgt 300

agtgaatgcc aagatatgaa ctgggggacg ttcaagggtta cccttacgga tgccttaatt 360  
 gatcatctgc aacctattca gggtcgatac gaggagatca tgtctgatcc aggttatttg 420  
 gacaatgttc tgctaaatgg ggcagggaaa gcttctgaga tagcagacgc caccctcaac 480  
 aacgtctacc aagccatggg tttcttgcg agatagcata tgtagaacat tttttataac 540  
 tgcacaatgc tagttttgca cttgttgcc tttctgctag tggtagctgat aagcgttttg 600  
 tttgatatgc ttggattagc cttttgttcc tgggttattat ggacactgtt aataggtatt 660  
 aaaaggatta tttactgaaa aaaaaaaaaa aaaaaaaaaa attaaaaggg ggcgcgcgta 720  
 ccata 725

<210> 20  
 <211> 171  
 <212> PRT  
 <213> Triticum aestivum

<400> 20  
 Leu Val Pro Asn Ser Ala Arg Gly Gly Ser Leu Phe Lys Val Pro Glu  
 1 5 10 15  
 Ala Leu Ile Pro Pro Ala Gly Ala Arg Val Met Ser Leu Thr Asp Gly  
 20 25 30  
 Leu Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Leu Ser Arg Ile Asn  
 35 40 45  
 Leu Leu Asp Pro Asn Asp Val Ile Val Asn Lys Ile Lys Arg Cys Lys  
 50 55 60  
 Thr Asp Ser Leu Pro Gly Leu Glu Phe Asp Asn Pro Glu Arg Pro Glu  
 65 70 75 80  
 Cys Lys Asn Leu Leu Ser Val Tyr Gln Ile Ile Thr Gly Lys Thr Lys  
 85 90 95  
 Glu Glu Val Val Ser Glu Cys Gln Asp Met Asn Trp Gly Thr Phe Lys  
 100 105 110  
 Val Thr Leu Thr Asp Ala Leu Ile Asp His Leu Gln Pro Ile Gln Val  
 115 120 125  
 Arg Tyr Glu Glu Ile Met Ser Asp Pro Gly Tyr Leu Asp Asn Val Leu  
 130 135 140  
 Leu Asn Gly Ala Gly Lys Ala Ser Glu Ile Ala Asp Ala Thr Leu Asn  
 145 150 155 160  
 Asn Val Tyr Gln Ala Met Gly Phe Leu Arg Arg  
 165 170

<210> 21  
 <211> 1062  
 <212> DNA  
 <213> Zea mays

<400> 21  
 gcacgaggga catcacgctg ctggatttcc tgagagaggt gggccgtttt gcacgctgtg 60  
 gtacaatgat cgccaaggag agcgtcaaga agcgtcttgc gtcggaagac gggatgagct 120  
 acaccgagtt tacctaccag ctgctgcagg gctacgactt cctttacatg ttcaagaata 180  
 tgggtgtcaa tgtgcagatc gggggcagcg atcagtgagg gaacatcaca gcgggaactg 240  
 agttgatcag aaaaatcttg caggttgaag gggcgcatgg actcacattc ccacttctgc 300  
 tgaagagcga cggtaccaa tttggaaaga cggaggatgg ggcaatctgg ctctcttcga 360

agatgctttc	tccttacaag	ttctatcagt	acttctttgc	ggtgccagac	atcgatgtca	420
tcagggttat	gaagatcctg	acgttcctga	gcttggtatga	gattctggag	ctagaagact	480
cgatgaagaa	gcctggctat	gtgccaaaca	ctgttcagaa	gaggcttgca	gaagaggtga	540
cgcgatttgt	tcatggcgag	gagggattgg	aggaggcatt	gaaggcaacc	gaggccttga	600
gacctgggtgc	tcagacacaa	ttggatgcac	aaacaattga	ggggatagca	gatgatgtgc	660
cttcatgctc	tttagcttat	gatcaagtgt	tcaagtctcc	acttattgat	ttggctgttt	720
ccacaggttt	gctcactagt	aagtcagcag	ttaagcggct	tattaagcaa	ggtggtctgt	780
acttgaataa	cgtgaggatt	gatagtggag	ataagctggt	tgaggaaggt	gatatagttg	840
atgggaaggt	gctcttggtg	tctgctggaa	agaagaacaa	gatggttggtg	aggatatctt	900
gactactctt	atttggtctt	tataacttat	tttagccatt	gaggagaaaa	gtaacgggtgt	960
tgtgtcttca	aaactcaaat	gagctgtcta	tgagcataca	gattgttata	ttggagaggt	1020
tgaacacacc	tttttttttg	ctctaaaaaa	aaaaaaaaaa	aa		1062

<210> 22  
 <211> 299  
 <212> PRT  
 <213> Zea mays

<400> 22  
 Thr Arg Asp Ile Thr Leu Leu Asp Phe Leu Arg Glu Val Gly Arg Phe  
           1                  5                  10                  15  
 Ala Arg Val Gly Thr Met Ile Ala Lys Glu Ser Val Lys Lys Arg Leu  
                   20                  25                  30  
 Ala Ser Glu Asp Gly Met Ser Tyr Thr Glu Phe Thr Tyr Gln Leu Leu  
                   35                  40                  45  
 Gln Gly Tyr Asp Phe Leu Tyr Met Phe Lys Asn Met Gly Val Asn Val  
                   50                  55                  60  
 Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ala Gly Thr Glu  
                   65                  70                  75                  80  
 Leu Ile Arg Lys Ile Leu Gln Val Glu Gly Ala His Gly Leu Thr Phe  
                   85                  90                  95  
 Pro Leu Leu Leu Lys Ser Asp Gly Thr Lys Phe Gly Lys Thr Glu Asp  
                   100                  105                  110  
 Gly Ala Ile Trp Leu Ser Ser Lys Met Leu Ser Pro Tyr Lys Phe Tyr  
                   115                  120                  125  
 Gln Tyr Phe Phe Ala Val Pro Asp Ile Asp Val Ile Arg Phe Met Lys  
                   130                  135                  140  
 Ile Leu Thr Phe Leu Ser Leu Asp Glu Ile Leu Glu Leu Glu Asp Ser  
                   145                  150                  155                  160  
 Met Lys Lys Pro Gly Tyr Val Pro Asn Thr Val Gln Lys Arg Leu Ala  
                   165                  170                  175  
 Glu Glu Val Thr Arg Phe Val His Gly Glu Glu Gly Leu Glu Glu Ala  
                   180                  185                  190  
 Leu Lys Ala Thr Glu Ala Leu Arg Pro Gly Ala Gln Thr Gln Leu Asp  
                   195                  200                  205  
 Ala Gln Thr Ile Glu Gly Ile Ala Asp Asp Val Pro Ser Cys Ser Leu  
                   210                  215                  220

Ala Tyr Asp Gln Val Phe Lys Ser Pro Leu Ile Asp Leu Ala Val Ser  
225 230 235 240

Thr Gly Leu Leu Thr Ser Lys Ser Ala Val Lys Arg Leu Ile Lys Gln  
245 250 255

Gly Gly Leu Tyr Leu Asn Asn Val Arg Ile Asp Ser Glu Asp Lys Leu  
260 265 270

Val Glu Glu Gly Asp Ile Val Asp Gly Lys Val Leu Leu Leu Ser Ala  
275 280 285

Gly Lys Lys Asn Lys Met Val Val Arg Ile Ser  
290 295

<210> 23

<211> 346

<212> PRT

<213> Drosophila melanogaster

<400> 23

Met Val Asp Lys Val Ala Asn Gly Val Ser Lys Lys Gly Ala Lys Lys  
1 5 10 15

Ala Lys Ala Ala Lys Lys Ala Lys Ala Asn Ala Ser Thr Ala Ala Ala  
20 25 30

Asn Asn Ser Gly Gly Asp Ser Ala Asp His Ala Ala Gly Arg Tyr Gly  
35 40 45

Ser Met Ser Lys Asp Lys Arg Ser Arg Asn Val Val Ser Ser Gly Val  
50 55 60

Gly Lys Gly Val Trp Val Arg Gly Arg Val His Thr Ser Arg Ala Lys  
65 70 75 80

Gly Lys Cys Arg Ser Ser Thr Val Cys Ala Val Gly Asp Val Ser Lys  
85 90 95

Met Val Lys Ala Gly Asn Lys Ser Asp Ala Lys Val Ala Val Ser Ser  
100 105 110

Lys Ser Cys Thr Ser Ser Val Val Ser Ala Lys Ala Asp Ala Ser Arg  
115 120 125

Asn Ala Asp Asp Ala Gly Asn Arg Val Asn Asp Thr Arg Asp Asn Arg  
130 135 140

Val Asp Arg Thr Ala Asn Ala Arg Ala Gly Val Cys Arg Arg Asp Thr  
145 150 155 160

Gly Thr His Thr Lys Ser Ala Ala Ser Gly Gly Ala Asn Val Thr Val  
165 170 175

Ser Tyr Lys Asp Ser Ala Tyr Ala Ser Tyr Lys Met Ala Ala Ala Asp  
180 185 190

Asp Lys Val Tyr Thr Val Gly Ala Val Arg Ala Asp Ser Asn Thr His  
195 200 205



Ile Ser Leu Ala Glu Pro Arg Leu Pro Leu Gln Leu Asp Asp Ala Ile  
 145 150 155 160  
 Arg Pro Glu Val Glu Gly Glu Glu Asp Gly Arg Ala Thr Val Asn Gln  
 165 170 175  
 Asp Thr Arg Leu Asp Asn Arg Ile Ile Asp Leu Arg Thr Ser Thr Ser  
 180 185 190  
 Gln Ala Ile Phe His Leu Gln Ser Gly Ile Cys His Leu Phe Arg Glu  
 195 200 205  
 Thr Leu Ile Asn Lys Gly Phe Val Glu Ile Gln Thr Pro Lys Ile Ile  
 210 215 220  
 Ser Ala Ala Ser Glu Gly Gly Ala Asn Val Phe Thr Val Ser Tyr Phe  
 225 230 235 240  
 Lys Ser Asn Ala Tyr Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met  
 245 250 255  
 Cys Ile Cys Ala Asp Phe Glu Lys Val Phe Cys Ile Gly Pro Val Phe  
 260 265 270  
 Arg Ala Glu Asp Ser Asn Thr His Arg His Leu Thr Glu Phe Val Gly  
 275 280 285  
 Leu Asp Ile Glu Met Ala Phe Asn Tyr His Tyr His Glu Val Val Glu  
 290 295 300  
 Glu Ile Ala Asp Thr Leu Val Gln Ile Phe Lys Gly Leu Gln Glu Arg  
 305 310 315 320  
 Phe Gln Thr Glu Ile Gln Thr Val Asn Lys Gln Phe Pro Cys Glu Pro  
 325 330 335  
 Phe Lys Phe Leu Glu Pro Thr Leu Arg Leu Glu Tyr Cys Glu Ala Leu  
 340 345 350  
 Ala Met Leu Arg Glu Ala Gly Val Glu Met Asp Asp Glu Glu Asp Leu  
 355 360 365  
 Ser Thr Pro Asn Glu Lys Leu Leu Gly Arg Leu Val Lys Glu Lys Tyr  
 370 375 380  
 Asp Thr Asp Phe Tyr Val Leu Asp Lys Tyr Pro Leu Ala Val Arg Pro  
 385 390 395 400  
 Phe Tyr Thr Met Pro Asp Pro Arg Asn Pro Lys Gln Ser Asn Ser Tyr  
 405 410 415  
 Asp Met Phe Met Arg Gly Glu Glu Ile Leu Ser Gly Ala Gln Arg Ile  
 420 425 430  
 His Asp Pro Gln Leu Leu Thr Glu Arg Ala Leu His His Gly Ile Asp  
 435 440 445  
 Leu Glu Lys Ile Lys Ala Tyr Ile Asp Ser Phe Arg Phe Gly Ala Pro  
 450 455 460

Pro His Ala Gly Gly Gly Ile Gly Leu Glu Arg Val Thr Met Leu Phe  
465 470 475 480

Leu Gly Leu His Asn Val Arg Gln Thr Ser Met Phe Pro Arg Asp Pro  
485 490 495

Lys Arg Leu Thr Pro  
500

<210> 25  
<211> 500  
<212> PRT  
<213> Homo sapiens

<400> 25  
Met Pro Ser Ala Thr Gln Arg Lys Ser Gln Glu Lys Pro Arg Glu Ile  
1 5 10 15

Met Asp Ala Ala Glu Asp Tyr Ala Lys Glu Arg Tyr Gly Ile Ser Ser  
20 25 30

Met Ile Gln Ser Gln Glu Lys Pro Asp Arg Val Leu Val Arg Val Arg  
35 40 45

Asp Leu Thr Ile Gln Lys Ala Asp Glu Val Val Trp Val Arg Ala Arg  
50 55 60

Val His Thr Ser Arg Ala Lys Gly Lys Gln Cys Phe Leu Val Leu Arg  
65 70 75 80

Gln Gln Gln Phe Asn Val Gln Ala Leu Val Ala Val Gly Asp His Ala  
85 90 95

Ser Lys Gln Met Val Lys Phe Ala Ala Asn Ile Asn Lys Glu Ser Ile  
100 105 110

Val Asp Val Glu Gly Val Val Arg Lys Val Asn Gln Lys Ile Gly Ser  
115 120 125

Cys Thr Gln Gln Asp Val Glu Leu His Val Gln Lys Ile Tyr Val Ile  
130 135 140

Ser Leu Ala Glu Pro Arg Leu Pro Leu Gln Leu Asp Asp Ala Val Arg  
145 150 155 160

Pro Glu Gln Glu Gly Glu Glu Glu Gly Arg Ala Thr Val Asn Gln Asp  
165 170 175

Thr Arg Leu Asp Asn Arg Val Ile Asp Leu Arg Thr Ser Thr Ser Gln  
180 185 190

Ala Val Phe Arg Leu Gln Ser Gly Ile Cys His Leu Phe Arg Glu Thr  
195 200 205

Leu Ile Asn Lys Gly Phe Val Glu Ile Gln Thr Pro Lys Ile Ile Ser  
210 215 220

Ala Ala Ser Glu Gly Gly Ala Asn Val Phe Thr Val Ser Tyr Phe Lys  
225 230 235 240



Asn Asn Ala Tyr Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met Cys  
 245 250 255  
 Ile Cys Ala Asp Phe Glu Lys Val Phe Ser Ile Gly Pro Val Phe Arg  
 260 265 270  
 Ala Glu Asp Ser Asn Thr His Arg His Leu Thr Glu Phe Val Gly Leu  
 275 280 285  
 Asp Ile Glu Met Ala Phe Asn Tyr His Tyr His Glu Val Met Glu Glu  
 290 295 300  
 Ile Ala Asp Thr Met Val Gln Ile Phe Lys Gly Leu Gln Glu Arg Phe  
 305 310 315 320  
 Gln Thr Glu Ile Gln Thr Val Asn Lys Gln Phe Pro Cys Glu Pro Phe  
 325 330 335  
 Lys Phe Leu Glu Pro Thr Leu Arg Leu Glu Tyr Cys Glu Ala Leu Ala  
 340 345 350  
 Met Leu Arg Glu Ala Gly Val Glu Met Gly Asp Glu Asp Asp Leu Ser  
 355 360 365  
 Thr Pro Asn Glu Lys Leu Leu Gly His Leu Val Lys Glu Lys Tyr Asp  
 370 375 380  
 Thr Asp Phe Tyr Ile Leu Asp Lys Tyr Pro Leu Ala Val Arg Pro Phe  
 385 390 395 400  
 Tyr Thr Met Pro Asp Pro Arg Asn Pro Lys Gln Ser Lys Ser Tyr Asp  
 405 410 415  
 Met Phe Met Arg Gly Glu Glu Ile Leu Ser Gly Ala Gln Arg Ile His  
 420 425 430  
 Asp Pro Gln Leu Leu Thr Glu Arg Ala Leu His His Gly Asn Asp Leu  
 435 440 445  
 Glu Lys Ile Lys Ala Tyr Ile Asp Ser Phe Arg Phe Gly Ala Pro Pro  
 450 455 460  
 His Ala Gly Gly Gly Ile Gly Leu Glu Arg Val Thr Met Leu Phe Leu  
 465 470 475 480  
 Gly Leu His Asn Val Arg Gln Thr Ser Met Phe Pro Arg Asp Pro Lys  
 485 490 495  
 Arg Leu Thr Pro  
 500

<210> 26

<211> 459

<212> PRT

<213> Haemophilus influenzae Rd

<400> 26

Met Leu Lys Ile Phe Asn Thr Leu Thr Arg Glu Lys Glu Ile Phe Lys  
 1 5 10 15

Pro Ile His Glu Asn Lys Val Gly Met Tyr Val Cys Gly Val Thr Val  
 20 25 30  
 Tyr Asp Leu Cys His Ile Gly His Gly Arg Thr Phe Val Cys Phe Asp  
 35 40 45  
 Val Ile Ala Arg Tyr Leu Arg Ser Leu Gly Tyr Asp Leu Thr Tyr Val  
 50 55 60  
 Arg Asn Ile Thr Asp Val Asp Asp Lys Ile Ile Lys Arg Ala Leu Glu  
 65 70 75 80  
 Asn Lys Glu Thr Cys Asp Gln Leu Val Asp Arg Met Val Gln Glu Met  
 85 90 95  
 Tyr Lys Asp Phe Asp Ala Leu Asn Val Leu Arg Pro Asp Phe Glu Pro  
 100 105 110  
 Arg Ala Thr His His Ile Pro Glu Ile Ile Glu Ile Val Glu Lys Leu  
 115 120 125  
 Ile Lys Arg Gly His Ala Tyr Val Ala Asp Asn Gly Asp Val Met Phe  
 130 135 140  
 Asp Val Glu Ser Phe Lys Glu Tyr Gly Lys Leu Ser Arg Gln Asp Leu  
 145 150 155 160  
 Glu Gln Leu Gln Ala Gly Ala Arg Ile Glu Ile Asn Glu Ile Lys Lys  
 165 170 175  
 Asn Pro Met Asp Phe Val Leu Trp Lys Met Ser Lys Glu Asn Glu Pro  
 180 185 190  
 Ser Trp Ala Ser Pro Trp Gly Ala Gly Arg Pro Gly Trp His Ile Glu  
 195 200 205  
 Cys Ser Ala Met Asn Cys Lys Gln Leu Gly Glu Tyr Phe Asp Ile His  
 210 215 220  
 Gly Gly Gly Ser Asp Leu Met Phe Pro His His Glu Asn Glu Ile Ala  
 225 230 235 240  
 Gln Ser Cys Cys Ala His Gly Gly Gln Tyr Val Asn Tyr Trp Ile His  
 245 250 255  
 Ser Gly Met Ile Met Val Asp Lys Glu Lys Met Ser Lys Ser Leu Gly  
 260 265 270  
 Asn Phe Phe Thr Ile Arg Asp Val Leu Asn His Tyr Asn Ala Glu Ala  
 275 280 285  
 Val Arg Tyr Phe Leu Leu Thr Ala His Tyr Arg Ser Gln Leu Asn Tyr  
 290 295 300  
 Ser Glu Glu Asn Leu Asn Leu Ala Gln Gly Ala Leu Glu Arg Leu Tyr  
 305 310 315 320  
 Thr Ala Leu Arg Gly Thr Asp Gln Ser Ala Val Ala Phe Gly Gly Glu  
 325 330 335

Asn Phe Val Ala Thr Phe Arg Glu Ala Met Asp Asp Asp Phe Asn Thr  
340 345 350

Pro Asn Ala Leu Ser Val Leu Phe Glu Met Ala Arg Glu Ile Asn Lys  
355 360 365

Leu Lys Thr Glu Asp Val Glu Lys Ala Asn Gly Leu Ala Ala Arg Leu  
370 375 380

Arg Glu Leu Gly Ala Ile Leu Gly Leu Leu Gln Gln Glu Pro Glu Lys  
385 390 395 400

Phe Leu Gln Ala Gly Ser Asn Asp Asp Glu Val Ala Lys Ile Glu Ala  
405 410 415

Leu Ile Lys Gln Arg Asn Glu Ala Arg Thr Ala Lys Asp Trp Ser Ala  
420 425 430

Ala Asp Ser Ala Arg Asn Glu Leu Thr Ala Met Gly Ile Val Leu Glu  
435 440 445

Asp Gly Pro Asn Gly Thr Thr Trp Arg Lys Gln  
450 455

<210> 27

<211> 461

<212> PRT

<213> Escherichia coli

<400> 27

Met Leu Lys Ile Phe Asn Thr Leu Thr Arg Gln Lys Glu Glu Phe Lys  
1 5 10 15

Pro Ile His Ala Gly Glu Val Gly Met Tyr Val Cys Gly Ile Thr Val  
20 25 30

Tyr Asp Leu Cys His Ile Gly His Gly Arg Thr Phe Val Ala Phe Asp  
35 40 45

Val Val Ala Arg Tyr Leu Arg Phe Leu Gly Tyr Lys Leu Lys Tyr Val  
50 55 60

Arg Asn Ile Thr Asp Ile Asp Asp Lys Ile Ile Lys Arg Ala Asn Glu  
65 70 75 80

Asn Gly Glu Ser Phe Val Ala Met Val Asp Arg Met Ile Ala Glu Met  
85 90 95

His Lys Asp Phe Asp Ala Leu Asn Ile Leu Arg Pro Asp Met Glu Pro  
100 105 110

Arg Ala Thr His His Ile Ala Glu Ile Ile Glu Leu Thr Glu Gln Leu  
115 120 125

Ile Ala Lys Gly His Ala Tyr Val Ala Asp Asn Gly Asp Val Met Phe  
130 135 140

Asp Val Pro Thr Asp Pro Thr Tyr Gly Val Leu Ser Arg Gln Asp Leu  
145 150 155 160

Asp Gln Leu Gln Ala Gly Ala Arg Val Asp Val Val Asp Asp Lys Arg  
 165 170 175  
 Asn Pro Met Asp Phe Val Leu Trp Lys Met Ser Lys Glu Gly Glu Pro  
 180 185 190  
 Ser Trp Pro Ser Pro Trp Gly Ala Gly Arg Pro Gly Trp His Ile Glu  
 195 200 205  
 Cys Ser Ala Met Asn Cys Lys Gln Leu Gly Asn His Phe Asp Ile His  
 210 215 220  
 Gly Gly Gly Ser Asp Leu Met Phe Pro His His Glu Asn Glu Ile Ala  
 225 230 235 240  
 Gln Ser Thr Cys Ala His Asp Gly Gln Tyr Val Asn Tyr Trp Met His  
 245 250 255  
 Ser Gly Met Val Met Val Asp Arg Glu Lys Met Ser Lys Ser Leu Gly  
 260 265 270  
 Asn Phe Phe Thr Val Arg Asp Val Leu Lys Tyr Tyr Asp Ala Glu Thr  
 275 280 285  
 Val Arg Tyr Phe Leu Met Ser Gly His Tyr Arg Ser Gln Leu Asn Tyr  
 290 295 300  
 Ser Glu Glu Asn Leu Lys Gln Ala Arg Ala Ala Val Glu Arg Leu Tyr  
 305 310 315 320  
 Thr Ala Leu Arg Gly Thr Asp Lys Thr Val Ala Pro Ala Gly Gly Glu  
 325 330 335  
 Ala Phe Glu Ala Arg Phe Ile Glu Ala Met Asp Asp Asp Phe Asn Thr  
 340 345 350  
 Pro Glu Ala Tyr Ser Val Leu Phe Asp Met Ala Arg Glu Val Asn Arg  
 355 360 365  
 Leu Lys Ala Glu Asp Met Ala Ala Ala Asn Ala Met Ala Ser His Leu  
 370 375 380  
 Arg Lys Leu Ser Ala Val Leu Gly Leu Leu Glu Gln Glu Pro Glu Ala  
 385 390 395 400  
 Phe Leu Gln Ser Gly Ala Gln Ala Asp Asp Ser Glu Val Ala Glu Ile  
 405 410 415  
 Glu Ala Leu Ile Gln Gln Arg Leu Asp Ala Arg Lys Ala Lys Asp Trp  
 420 425 430  
 Ala Ala Ala Asp Ala Ala Arg Asp Arg Leu Asn Glu Met Gly Ile Val  
 435 440 445  
 Leu Glu Asp Gly Pro Gln Gly Thr Thr Trp Arg Arg Lys  
 450 455 460

<210> 28  
 <211> 377

<212> PRT  
<213> Synechocystis sp.

<400> 28  
Met Lys Asn Cys Glu Asn Asp His Arg Phe Thr Thr Val Ser Ser Gly  
1 5 10 15  
Lys Ala Trp Gly Gln Leu His Arg Phe Pro Ser Leu Ile Lys Phe Asn  
20 25 30  
Phe Ala His Arg Ser Thr Thr Ala Met Asp Lys Pro Arg Ile Leu Ser  
35 40 45  
Gly Val Gln Pro Thr Gly Asn Leu His Leu Gly Asn Tyr Leu Gly Ala  
50 55 60  
Ile Arg Ser Trp Val Glu Gln Gln Gln His Tyr Asp Asn Phe Phe Cys  
65 70 75 80  
Val Val Asp Leu His Ala Ile Thr Val Pro His Asn Pro Gln Thr Leu  
85 90 95  
Ala Gln Asp Thr Leu Thr Ile Ala Ala Leu Tyr Leu Ala Cys Gly Ile  
100 105 110  
Asp Leu Gln Tyr Ser Thr Ile Phe Val Gln Ser His Val Ala Ala His  
115 120 125  
Ser Glu Leu Ala Trp Leu Leu Asn Cys Val Thr Pro Leu Asn Trp Leu  
130 135 140  
Glu Arg Met Ile Gln Phe Lys Glu Lys Ala Val Lys Gln Gly Glu Asn  
145 150 155 160  
Val Ser Val Gly Leu Leu Asp Tyr Pro Val Leu Met Ala Ala Asp Ile  
165 170 175  
Leu Leu Tyr Asp Ala Asp Lys Val Pro Val Gly Glu Asp Gln Lys Gln  
180 185 190  
His Leu Glu Leu Thr Arg Asp Ile Val Ile Arg Ile Asn Asp Lys Phe  
195 200 205  
Gly Arg Glu Asp Ala Pro Val Leu Lys Leu Pro Glu Pro Leu Ile Arg  
210 215 220  
Lys Glu Gly Ala Arg Val Met Ser Leu Ala Asp Gly Thr Lys Lys Met  
225 230 235 240  
Ser Lys Ser Asp Glu Ser Glu Leu Ser Arg Ile Asn Leu Leu Asp Pro  
245 250 255  
Pro Glu Met Ile Lys Lys Lys Val Lys Lys Cys Lys Thr Asp Pro Gln  
260 265 270  
Arg Gly Leu Trp Phe Asp Asp Pro Glu Arg Pro Glu Cys His Asn Leu  
275 280 285  
Leu Thr Leu Tyr Thr Leu Leu Ser Asn Gln Thr Lys Glu Ala Val Ala  
290 295 300

Gln Glu Cys Ala Glu Met Gly Trp Gly Gln Phe Lys Pro Leu Leu Thr  
305 310 315 320

Glu Thr Ala Ile Ala Ala Leu Glu Pro Ile Gln Ala Lys Tyr Ala Glu  
325 330 335

Ile Leu Ala Asp Arg Gly Glu Leu Asp Arg Ile Ile Gln Ala Gly Asn  
340 345 350

Ala Lys Ala Ser Gln Thr Ala Gln Gln Thr Leu Ala Arg Val Arg Asp  
355 360 365

Ala Leu Gly Phe Leu Ala Pro Pro Tyr  
370 375

<210> 29

<211> 419

<212> PRT

<213> Bacillus caldotenax

<400> 29

Met Asp Leu Leu Ala Glu Leu Gln Trp Arg Gly Leu Val Asn Gln Thr  
1 5 10 15

Thr Asp Glu Asp Gly Leu Arg Lys Leu Leu Asn Glu Glu Arg Val Thr  
20 25 30

Leu Tyr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His Ile Gly Asn  
35 40 45

Leu Ala Ala Ile Leu Thr Leu Arg Arg Phe Gln Gln Ala Gly His Arg  
50 55 60

Pro Ile Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly Asp Pro Ser  
65 70 75 80

Gly Lys Lys Ser Glu Arg Thr Leu Asn Ala Lys Glu Thr Val Glu Ala  
85 90 95

Trp Ser Ala Arg Ile Lys Glu Gln Leu Gly Arg Phe Leu Asp Phe Glu  
100 105 110

Ala Asp Gly Asn Pro Ala Lys Ile Lys Asn Asn Tyr Asp Trp Ile Gly  
115 120 125

Pro Leu Asp Val Ile Thr Phe Leu Arg Asp Val Gly Lys His Phe Ser  
130 135 140

Val Asn Tyr Met Met Ala Lys Glu Ser Val Gln Ser Arg Ile Glu Thr  
145 150 155 160

Gly Ile Ser Phe Thr Glu Phe Ser Tyr Met Met Leu Gln Ala Tyr Asp  
165 170 175

Phe Leu Arg Leu Tyr Glu Thr Glu Gly Cys Arg Leu Gln Ile Gly Gly  
180 185 190

Ser Asp Gln Trp Gly Asn Ile Thr Ala Gly Leu Glu Leu Ile Arg Lys  
195 200 205

Thr Lys Gly Glu Ala Arg Ala Phe Gly Leu Thr Ile Pro Leu Val Thr  
 210 215 220  
 Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu Ser Gly Thr Ile Trp  
 225 230 235 240  
 Leu Asp Lys Glu Lys Thr Ser Pro Tyr Glu Phe Tyr Gln Phe Trp Ile  
 245 250 255  
 Asn Thr Asp Asp Arg Asp Val Ile Arg Tyr Leu Lys Tyr Phe Thr Phe  
 260 265 270  
 Leu Ser Lys Glu Glu Ile Glu Ala Leu Glu Gln Glu Leu Arg Glu Ala  
 275 280 285  
 Pro Glu Lys Arg Ala Ala Gln Lys Ala Leu Ala Glu Glu Val Thr Lys  
 290 295 300  
 Leu Val His Gly Glu Glu Ala Leu Arg Gln Ala Ile Arg Ile Ser Glu  
 305 310 315 320  
 Ala Leu Phe Ser Gly Asp Ile Ala Asn Leu Thr Ala Ala Glu Ile Glu  
 325 330 335  
 Gln Gly Phe Lys Asp Val Pro Ser Phe Val His Glu Gly Gly Asp Val  
 340 345 350  
 Pro Leu Val Glu Leu Leu Val Ser Ala Gly Ile Ser Pro Ser Lys Arg  
 355 360 365  
 Gln Ala Arg Glu Asp Ile Gln Asn Gly Ala Ile Tyr Val Asn Gly Glu  
 370 375 380  
 Arg Leu Gln Asp Val Gly Ala Ile Leu Thr Ala Glu His Arg Leu Glu  
 385 390 395 400  
 Gly Arg Phe Thr Val Ile Arg Arg Gly Lys Lys Lys Tyr Tyr Leu Ile  
 405 410 415  
 Arg Tyr Ala